

Basic Motor Diagnostics to Use When Troubleshooting a VFD and an Electrical Motor

In equipment with three phase windings all phases should be identical (same number turns, same wire size, coil diameter, etc.) Consequently, all characteristics of the windings should also be similar. If a change occurs in any one of these characteristics, the change is never for the better, (windings do not repair themselves) as degradation is taking place.

By analyzing the amount and relationships of the change it is possible to identify the cause of the degradation. Once the cause and the severity of the degradation are known it is now possible to determine the necessary action.

In a healthy 3-phase motor, all winding measurements should be balanced.

All Balanced = **Good**
 One or more Unbalanced = **Not Good**

What do YOU do when a motor fails?

What tools do you currently use to determine if the motor is “good” or “bad”?

If you’re like most people, you probably have a Meg-ohm Meter and a Digital Multi-Meter.

MegOhm Meter	>999 MΩ
PHASE	Resistance (R)
1-2	14.2 Ω
1-3	14.2 Ω
2-3	14.2 Ω

Let’s look at an actual motor test on an installed motor where the drive had tripped.

- What would you say about the condition of this motor?
- Did you replace the drive or the motor?

Using Motor Circuit Analysis™ (MCA™), this is what the electrician found.

MegOhm Meter	>999MΩ	MCA™		
PHASE	Resistance (R)	Impedance (Z)	Phase Angle (FI)	Current/Frequency Response (I/F)
1-2	14.2	412	64°	-29
1-3	14.2	421	63°	-28
2-3	14.2	427	64°	-29

If you replaced the motor, you cost your company time and money, both in the cost of the motor and you’ll have to replace or repair the drive when it trips again.

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Guess what? The same electrician had an identical motor trip the drive on a different line.

MegOhm Meter	>999 MΩ
PHASE	Resistance (R)
1-2	17.1 Ω
1-3	17.1 Ω
2-3	17.1 Ω

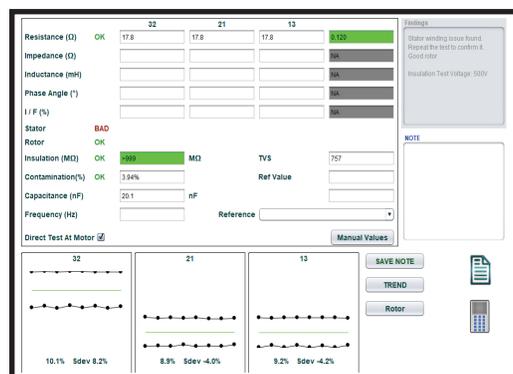
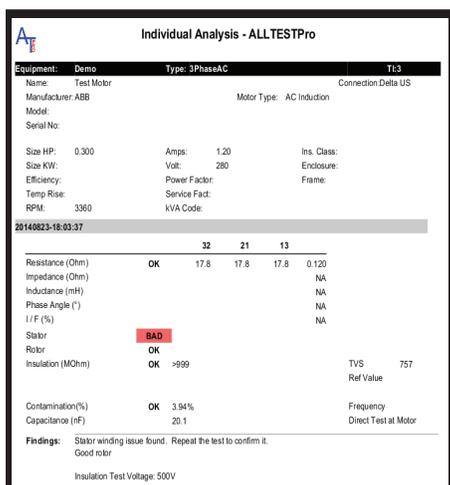
Using Motor Circuit Analysis™ (MCA™), this is what that same electrician found.

MegOhm Meter	>999MΩ			
PHASE	Resistance (R)	Impedance (Z)	Phase Angle (FI)	Current/Frequency Response (I/F)
1-2	14.1	438	64°	-29
1-3	14.3	444	63°	-28
2-3	14.2	482	61°	-32

What would you say about the condition of this motor?

If you said, “The Motor is bad”, you are correct.

ALL-TEST Pro is committed to ensuring the reliability of motors in the field and maximizing the productivity of maintenance teams everywhere. Our equipment is used in commercial, government and military institutions worldwide. Applications include AC/DC electric motors, transmission, distribution transformers, machine tool motors, servo motors, AC/DC traction motors and more.



(Sample Software and Instrument screen shots. Does not represent what is discussed above.)